

O-6 Optical Property Degradation of the Hubble Space Telescope's Wide Field Camera-2 Pick Off Mirror.

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Degradation in the performance of optical components can be greatly affected by exposure to the space environment. Many factors can contribute to such degradation including surface contaminants; outgassing; vacuum, UV, and atomic oxygen exposure; temperature cycling; or combinations of parameters. In-situ observations give important clues to degradation processes, but there are relatively few opportunities to correlate those observations with post-flight ground analyses. The return of instruments from the Hubble Space Telescope (HST) after its final servicing mission in May 2009 provided such an opportunity. Among the instruments returned from HST was the Wide-Field Planetary Camera-2 (WFPC-2), which had been exposed to the space environment for 16 years. This work focuses on the identifying the sources of degradation in the performance of the Pick-off mirror (POM) from WFPC-2. Techniques including surface reflectivity measurements, spectroscopic ellipsometry, FTIR (and ATR-FTIR) analyses, SEM/EDS, X-ray photoelectron spectroscopy (XPS) with and without ion milling, and wet and dry physical surface sampling were performed. Destructive and contact analyses took place only after completion of the non-destructive measurements. Spectroscopic ellipsometry was then repeated to determine the extent of contaminant removal by the destructive techniques, providing insight into the nature and extent of polymerization of the contaminant layer.

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